



COURSE COMPACT

2017/2018 Academic Session.

COLLEGE: College of Science and Engineering
DEPARTMENT: Agric. And Biosystems Engineering
PROGRAMME: Agricultural Engineering
COURSE COMPACT for: Bio Processing Engineering

Course

Course code: ABE 533
Course title: Bio Process Engineering
Credit unit: 2
Course status: Elective

Lecturer's Data

Name of the lecturer: Dr. Okunola, A. A.
Qualifications obtained: B.Sc, M.Sc, Ph.D. & B. Eng
Department: Agric. & Biosystems Engineering
College: College of Science & Engineering
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Office Location: A 215 NCB

Consultation Hours: Tuesdays & Thursdays 2 – 3.00 pm

INTRODUCTION TO THE COURSE

Course Description – Unit operations in food and bio product processing. Process measurement, observation and control. Energy and momentum balance as related to process efficiency calculations. Trans - esterification process. Microbial production systems. Bioreactor design. Engineering systems for product development.

Course Justification – This course will be useful to expose students to the various unit operations in food and bio product processing industries and research organizations where they can work during Industrial attachments or upon graduation. The knowledge acquired shall also be relevant in optimization of energy and material requirements in food and bio products processing. Furthermore, production of bio fuel like diesel and gas will be undertaken during the course duration. As well as appropriate technology developments for the engineering components of the production systems.

Course Objectives- At the end of the course, students will be able to comprehend the working principles of different unit operations involved in food and bio – product processing. They should also design production layout and manage the production systems.

Course Requirement – To derive maximum benefits from the course and for fast grasping of various activities of unit operations in food and bio processing, the course requires that the students take and pass courses in either Properties of bio and agricultural materials or Food engineering.

Course Expectations:

S/N	GRADING	SCORE (%)
1.	Continuous Assessments	
	• C.A. I	7%
	• C.A. II (Mid-Semester Test)	15%
	• C.A. III	8%
2.	Assignment	
3.	Practical (Laboratory work)/ Case Studies	10%
4.	Final Examination	60%
5.	Total	100

N.B.

This varies from College to College. So please, adopt the appropriate modality as suitable to the specific programme

Course Delivery Strategies *Student centred Lecturing method complimented with laboratory work. Power point presentation were incorporated for some relevant data and other technical information were disseminated through hand outs Students were sometimes grouped to carry the assignment work*

Course Duration

LECTURE CONTENT

Break into module and modules into weeks, indicating objectives, description, study question and other information as posted below.

Module 1

➤ **Week 1: Introduction**

➤ **Objectives**

The students at the end of the lectures for the week should be able to

- i. Have an overview of Bio process and Unit operations

➤ **Description**

First hour: Definition of terms Bio technology, bio processing, bio chemical engineering; Fundamentals of Bio processing. Comparison of traditional and modern bio technology

Second hour: Class discussion was generated on importance of biotechnology operations Question, Pause, Name and Answer technique was used

- **Study Question:** Outline fundamentals of Bio processing. Differentiate between traditional and modern bio processing

➤ **Reading List –**

1. Unit operations in Food processing R. L. Earle and M. Earle, Pergamon Press
2. Lecture notes

Module 1

Week 2

Topic: Basic principles in food Processing Engineering

➤ **Objectives:**

The students at the end of the lectures for the week should be able to

- i. Identify units operations in food engineering
- ii. Recall previous knowledge on mass & energy balance
- iii. Fundamental dimensions and units

➤ **Description**

First hour: Verbal exposition and chalk board presentation on various unit operations in food processing engineering. Students participated in discussion on laws of conservation of mass and energy.

Second hour: Slide projection was made on units and dimensions and calculations were carried out on some engineering quantities. Velocity, acceleration, energy, power, specific gravity and pressure.

➤ **Study Question:** Enumerate four dimensionless ratios / numbers

➤ **Reading List:**

1. Unit operations in Food processing R. L. Earle and M. Earle, Pergamon Press
2. Lecture notes

Module 2

Week 3

Topic: Materials Balances

➤ **Objectives**

The students at the end of the lectures for the week should be able to

- i. Define and describe the laws of mass balances
- ii. Solve problems related to materials balances

➤ **Description**

First hour: Definition and illustration on principles of mass balance in unit operations

Second hour: Calculations on various materials balances E.g. Constituent balance of milk, molar concentrations and carbonation of soft drinks; blending of minced meat.

➤ **Study Question** Solve assignments

➤ **Reading List -**

1. *Unit operations in Food processing R. L. Earle and M. Earle, Pergamon Press.*
2. *Information on periodic table*

Week 4: Topic: Energy Balances

➤ **Objectives**

The students at the end of the lectures for the week should be able to

- i. Define and describe the laws of energy balances
- ii. Solve problems related to energy balances

➤ **Description**

First hour: Definition and illustration on principles of energy balance in unit operations

Second hour: Calculations on various energy balances; heat balance – drying and cooling and conversion of energy.

- **Study Question** Solve assignments
- **Reading List -**

1. *Unit operations in Food processing R. L. Earle and M. Earle, Pergamon Press.*
2. Psychometric chart and steam tables

Module 3

Week 5 Theory of fluid flow

- **Objectives**

The students at the end of the lectures for the week should be able to

- i. Understand and describe the theory of fluid flow
- ii. Solve problems related to fluid flow

- **Description**

First hour: Identification of fluids in food industries and illustration on principles of fluid flow in unit operations. Differentiate between static and dynamic fluids.

Second hour: Calculations on various fluid flow problems.

- **Study Question** Solve assignments
- **Reading List -**

1. *Unit operations in Food processing R. L. Earle and M. Earle, Pergamon Press.*
2. Psychometric chart and steam tables

Module 3

Week 6 Heat Transfer Theory

- **Objectives**

The students at the end of the lectures for the week should be able to

- i. Define and describe the principles of heat transfer
- ii. Identify the mediums of heat transfer

- **Description**

First hour: Definition and illustration on principles of heat transfer in unit operations

Second hour: Descriptions of various medium of heat transfer i.e. conduction, convection and radiation.

- **Study Question** Solve assignments
- **Reading List -**

1. *Unit operations in Food processing R. L. Earle and M. Earle, Pergamon Press.*
2. Psychometric chart and steam tables

Week 7 Heat Transfer Application

- **Objectives**

The students at the end of the lectures for the week should be able to

- i. Identify heat transfer operations
- ii. Describe the application of heat transfer in unit operations

- **Description**

First hour: Descriptions of heat transfer operations

Second hour: Descriptions of various heat transfer equipment.

- **Reading List -**

1. *Unit operations in Food processing R. L. Earle and M. Earle, Pergamon Press.*
2. Lecture notes

Week 8 Practical on Fluid flow & Heat Transfer Application

➤ Description

First hour: Practical sessions

Second hour: Practical sessions

➤ Study Question: Report practical in logbook

➤ Reading List –

1. Unit operations in Food processing R. L. Earle and M. Earle, Pergamon Press.

2. Psychometric chart and steam tables

Week 9 Mid Semester test

Module 4

Week 10 **Mechanical Separations**

➤ Objectives

The students at the end of the lectures for the week should be able to

i. Identify various mechanical separations in unit operations

ii. Describe the mechanical separations in unit operations

➤ Description

First hour: verbal exposition and chalk board illustrations on various mechanical separations in food processing i.e. sedimentations, sieving, centrifugal separations and pneumatic separation

Second hour: Continuation on types of mechanical separations

➤ Reading List -

1. Unit operations in Food processing R. L. Earle and M. Earle, Pergamon Press.

2. 2. Lecture notes

Module 5

Week 11 **Size Reduction**

➤ Objectives

The students at the end of the lectures for the week should be able to

i. Identify various methods of size reductions

ii. Describe the operations size reduction equipment

➤ Description

First hour: Verbal exposition and chalk board illustration on hammer mill and burr mill

Second hour: Discussions on operational characteristics, advantages and disadvantages of using the mills.

➤ Study Questions: Solve assignments

➤ Reading List -

1. *Unit operations in Food processing R. L. Earle and M. Earle, Pergamon Press.*

2. **Lecture notes**

Week 12 **Size Reduction continued**

Objectives

The students at the end of the laboratory for the week should be able to

i. Determine particle size analysis

Description

First hour: sorting of milled grains in various sizes using set of Tyler sieves.

Second hour: Report on particle size analysis on graph sheet

Ø Reading List -

1. *Unit operations in Food processing R. L. Earle and M. Earle, Pergamon Press.*

2. 2. Lecture notes

Module 6
Week 13 **Oil Extraction and transformation**

➤ **Objectives**

The students at the end of the lectures for the week should be able to

- i. Identify various methods of oil extraction
- ii. Understand theory of Bio transformation

➤ **Description**

First hour: Descriptions of various ways of oil extraction E. G. mechanical and solvent extraction

Second hour: Verbal exposition on esterification and trans esterification process of Vegetable oil into Bio fuel

➤ **Reading List –**

- 1. *Unit operations in Food processing R. L. Earle and M. Earle, Pergamon Press.*
- 2. Lecture notes

Week 14 Revision

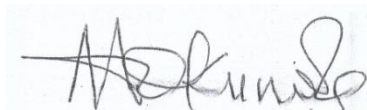
Objectives

The students at the end of the lectures for the week should be able to

- i. Participate actively in solving problems and have correct solutions to previous assignments.

Week 15 Examination

HOD's Observations and further Comments –Course compact is adequate-----



Name: Dr. Okunola, A. A.

Signature -----

Date-24/8/2017